

REMARKS

Claims 1-20 are in this application and are presented for consideration. By this Amendment, Applicant has amended claims 1-14. Applicant has also added new dependent claims 15-20.

The Office Action states that the title of the invention is not descriptive. Applicant has amended the title as shown above.

Claims 1, 3 and 11-14 have been rejected under 35 U.S.C. 102(b) as being anticipated by JP 2002-195247 (hereinafter "JP '247").

JP '247 discloses a hinge shaft 23 including a shaft 27 and larger diameter portion 28 that has a structure in which the larger diameter portion 28 is accommodated within a cover 22. The shaft 27 protrudes outward with respect to the cover 22, the leaf spring member 24 of circumferentially corrugated configuration and the spheres 25 are disposed while in contact with one another, and one of the leaf spring member 24 and the spheres 25 is/are rotated together with the rotation of the hinge shaft 23 while the other is not rotated. With this structure, when the hinge shaft 23 is rotated, the leaf spring member 24 of circumferentially corrugated configuration is elastically deformed by the spheres 25, so the larger diameter portion 28 of the hinge shaft 23 is pressed against the inner surface of the cover 22, whereby torque is generated in the hinge shaft 23. When the leaf spring 24 is elastically deformed by the spheres 25, the contact pressure between the leaf spring member 24 and the spheres 25 changes in accordance therewith, so torque is generated in this case as well. However, since the leaf spring member 24 and the spheres 25 are held in rolling contact with each other, the torque generated in this

case is small, so it is determined that the torque is mainly generated by pressing the larger diameter portion 28 of the hinge shaft 23 against the inner surface of the cover 22.

In the invention according to claims 1 and 2, the leaf spring member having the curved portion and the fixing plate having at least two protrusions are inserted onto the movable shaft so that they are pressed into contact for relative rotation therebetween. At the rotational position where the curved portion of the leaf spring member is overlapped with the protrusions of the fixing plate, the leaf spring member is compressed. This advantageously allows a large rotational torque to be generated. At the rotational position where the curved portion of the leaf spring member and the protrusions of the fixed plate are shifted from each other, a small rotational torque is generated. The rotational torque is transmitted to the movable shaft through the intermediation of the leaf spring portion in claim 1 and of the fixing plate in claim 2.

Compared with the present invention, in the hinge device according to '247, the hinge shaft 23 including the shaft 27 and larger diameter portion 28 has the structure in which the larger diameter portion 28 is accommodated within the cover 22, the shaft 27 protrudes outward with respect to the cover 22, the leaf spring member 24 of circumferentially corrugated configuration and the spheres 25 are disposed while in contact with one another, and when the hinge shaft 23 rotates, one of the leaf spring member 24 and the spheres 25 is rotated together with the rotation of the hinge shaft 23 while the other thereof is not rotated. With this structure, when the hinge shaft 23 is rotated, the leaf spring member 24 of circumferentially corrugated configuration is elastically deformed by the spheres 25, so the larger diameter

portion 28 of the hinge shaft 23 is pressed against the inner surface of the cover 22, whereby torque is generated in the hinge shaft 23. When the leaf spring 24 is elastically deformed by the spheres 25, the contact pressure between the leaf spring member 24 and the spheres 25 changes in accordance therewith, so that torque is generated in this case as well. However, since the leaf spring member 24 and the spheres 25 are held in rolling contact with each other, the torque generated in this case is small, so that the torque is mainly generated by pressing the larger diameter portion 28 of the hinge shaft 23 against the inner surface of the cover 22.

In contrast to JP '247, rotational torque of the present invention is generated by the frictional force when the leaf spring member and the fixed plate inserted onto the movable shaft are pressed into contact with each other for relative rotation therebetween. According to the present invention, the rotational torque is transmitted to the movable shaft through the intermediation of the leaf spring portion and of the fixing plate. The magnitude of the rotational torque in this case is changed in accordance with the magnitude of pressing force by the elastic deformation of the leaf spring member having the curved portion therein. Further, the elastic deformation of the leaf spring member is performed by the protrusions of the fixed plate. Compared with the present invention, the larger diameter portion 28 of the hinge shaft 23 of JP '247 is pressed against the inner surface of the cover 22, so the frictional force is generated between the larger diameter portion 28 and the inner surface of the cover 22, whereby rotational torque is generated. According to JP '247, the magnitude of the rotational torque in this case is changed in accordance with the magnitude of pressing force by the elastic deformation of the leaf spring member 24. The elastic deformation of the leaf spring 24 is

performed by the spheres 25. In short, rotational torque of the present invention is transmitted to the movable shaft, which is generated by the relative rotation between the leaf spring member having the curved portion and the fixed plate having protrusions which are pressed into contact with the curved portion of the leaf spring member. In contrast to the present invention, JP '247 discloses that the larger diameter portion 28 of the hinge shaft 23 is pressed against the inner surface of the cover 22, so the rotational torque is generated, that is, the rotational torque is directly generated in the hinge shaft 23. Therefore, the inventions according to claims 1 and 2 and the invention according to JP '247 are different in basic structure from each other.

Further, JP '247 fails to teach or suggest the combination of a leaf spring member having a curved portion that is axially movably inserted onto a movable shaft and a fixing plate that is inserted onto the movable shaft such that the fixing plate does not rotate when the movable shaft rotates. According to the present invention, the fixing plate is axially movable and the fixing plate has a surface that defines at least two protrusions that are in contact with the leaf spring member. Since the leaf spring member and the fixing plate of the present invention are inserted onto the movable shaft, the member corresponding to the cover 22 of JP '247 is advantageously not required. In contrast to the present invention, the invention according to JP '247 accommodates the larger diameter portion 28 of the hinge shaft 23, the leaf spring 24, and the spheres 25 so as to press the larger diameter portion against the inner surface of the cover 22. Thus, the cover 22 is crucial to the invention disclosed in JP '247. Since the present invention includes a spring leaf member and a fixing plate that are axially movable, the leaf spring member and the fixing plate can be moved in the axial direction of the movable shaft so

that the pressure contact force between the spring leaf member and the fixing plate can be adjusted. Compared with the present invention, the invention according to JP '247 does not include such an adjustment mechanism. As such, the prior art as a whole takes a different approach and fails to disclose each feature of the claimed combination.

Claims 1 and 5 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2002-030852 (hereinafter "JP '852").

The opening/closing device according to JP '852 includes a hinge shaft 1 fixed to a member on one side. A base member 2 is rotatably inserted onto the hinge shaft 1 and fixed to a member on the other side. A spring member 3 is axially movably inserted while restrained from being rotated by the hinge shaft 1 and pressed against the base member 2 by a regulating member 4. The contact surface between the base member 2 and the spring member 3 is formed on the cam. When the hinge shaft 1 is rotated, the spring member 3 is rotated in synchronism therewith, so the spring member 3 is elastically deformed by the contact surface on the cam with respect to the base member 2, and the contact pressure on the contact surface with respect to the base member 2 is changed, whereby torque is generated in the hinge shaft 1. The base member 2 of JP '852 is fixed to the member on the other side. The base member 2 has a short cylindrical configuration and is provided with the shaft hole 2a through the center thereof. the base member 2 is formed with a non-circular configuration portion 2c on the outer surface thereof. The base member 2 is formed with a V-shaped groove 2b as a cam on the one end surface thereof. JP '852 describes that a clicking sensation is produced when the protrusion 3b of the spring member 3 is fitted with the V-shaped groove 2b of the base member 2. JP '852

describes that large rotational torque can be obtained by disposing the spring members (spring washer) 3 on both the sides of the base member 2, and that still larger rotational torque can be obtained by using the plurality of spring washers 3.

JP '852 fails to teach and fails to suggest a fixing plate as claimed. The Office Action takes the position that it is easily conceived to cut off the cam 2b from the base member 2 of JP '852. Applicant respectfully disagrees. The base member 2 of JP '852 is fixed to the member on the other side, has a short cylindrical configuration and is provided with a shaft hole 2a through the center thereof. The base member 2 of JP '852 is formed with the non-circular configuration portion 2c on the outer surface thereof, and is formed with the V-shaped groove 2b as a cam on the one end surface thereof. Thus, the cam 2b of the base member 2 cannot be separately cut off therefrom. JP '852 fails to provide the person of ordinary skill in the art with any teaching or suggestion of cutting off only the cam 2b from the base member 2. In contrast with JP '852, the fixing plate of the present invention advantageously reduces the amount of space in a longitudinal direction. This advantageously provides a hinge device that is smaller and easier to manufacture. In fact, JP '852 discloses that the base member 2 is fixed to the member on the other side. In contrast with JP '852 the fixing plate of the present invention is not fixed to the member on the other side. According to the present invention, the leaf spring member having the curved portion and the fixing plate having at least two protrusions are pressed into contact with each other for relative rotation therebetween, so that a large rotational torque is advantageously generated. This advantageously provides smooth torque characteristics are obtained (see torque characteristic diagrams of Figs. 9, 11, and 13 in the

specification), and the positions, numbers, and sizes of the protrusions of the fixing plate can be appropriately selected so that various torque characteristics are advantageously obtained. In contrast to the present invention, the clicking sensation of JP '852 is produced when the V-shaped groove (cam) 2b of the base member 2 is fitted with the angular protrusion 3b of the spring washer 3. This disadvantageously produces an abrupt torque change when the device is rotated into the fitted state since JP '852 fails to disclose a fixing plate as claimed. As such, the prior art as a whole takes a different approach and fails to direct the person of ordinary skill in the art toward each feature of the claimed combination. Accordingly, Applicant respectfully requests that the Examiner favorably consider claim 1 as now presented and all claims that depend thereon.

Claim 2 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '247.

As previously discussed above with regard to claim 1, JP '247 fails to provide any teaching or suggestion for a fixing plate as claimed. JP '247 does not disclose a separate fixing plate as claimed and fails to provide any suggestion for modifying the base member 2 to form a fixing plate as claimed. As such, the prior art as a whole fails to direct the person of ordinary skill in the art toward the features claimed. Accordingly, Applicant respectfully requests that the Examiner favorably consider claim 2 as now presented.

Claims 6-10 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2002-030852, and further in view of JP 2001-041228 (hereinafter "JP '228").

The tilt hinge according to JP '228 includes an attachment member 1. A rotatable shaft 2 is rotatably attached to the attachment member 1. A first friction washer 4 is inserted onto

the rotatable shaft 2. The hinge further has a second friction washer 6, a spring washer 7, and a press washer 8. When the washer 8 side of the rotatable shaft 2 is swaged, the second friction washer 6 and the first friction washer 4 are pressed into contact with the spring washer 7 and the bearing plate 1b of the attachment member 1, respectively. When the rotatable shaft 2 is rotated, friction torque is generated between the second friction washer 6 and the spring washer 7 and between the first friction washer 4 and the bearing plate 1b of the attachment member 1. A reinforcing plate 5 is provided on one of the sides of the bearing plate 1b. The reinforcing plate 5 is rotatable together with the rotatable shaft 2 and applied with elasticity. A suction mechanism is provided between the reinforcing plate 5 and the attachment member 1.

JP '852 and JP '228 fail to teach and fail to suggest the combination of at least two protrusions defined on a surface of a bracket wherein the protrusions are in contact with a leaf spring member. The Office Action takes the position that the bracket 1 of JP '228 has at least two protrusions as featured in the present invention. However, drawings 1 and 5 of JP '228 do not show that the bracket 1 has any protrusions in contact with the spring washer 7 as claimed. In fact, JP '228 is completely void of any suggestion that the spring washer 7 is in contact with the bracket 1 as claimed. In contrast to JP '228, the leaf spring member of the present invention is pressed into contact with the bracket for rotation therebetween. This advantageously allows a large rotational torque to be generated. JP '228 fails to disclose such advantages since the bracket 1 of JP '228 does not have any protrusions in contact with the spring washer 7 as claimed. As such the prior art as a whole fails to provide the person of ordinary skill in the art with any teaching or suggestion for the features of the claimed combination. Accordingly,

Applicant respectfully requests that the Examiner favorably consider claims 6 and 8 as now presented and all claims that respectively depend thereon.

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '852, and further in view of JP '247. Although JP '247 discloses a hinge device comprised of a square cylinder-shaped cover 22 forming an opening 26, the references as a whole fail to suggest the combination of features claimed. Specifically, the references as a whole fail to provide any suggestion or teaching for the combination of a fixing plate that does not rotate when a movable shaft rotates. As such, the references do not suggest the invention and therefore all claims define over the prior art as a whole.

Applicant has added new dependent claims 15-20 to further clarify the features of the invention. The new claims highlight that a nut and a washer press the leaf spring member into contact with the fixing plate. Applicant respectfully requests that the Examiner favorably consider new dependent claims 15-20.

Favorable action on the merits is requested.

Respectfully submitted
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Attached: Petition for Two Month Extension of Time

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